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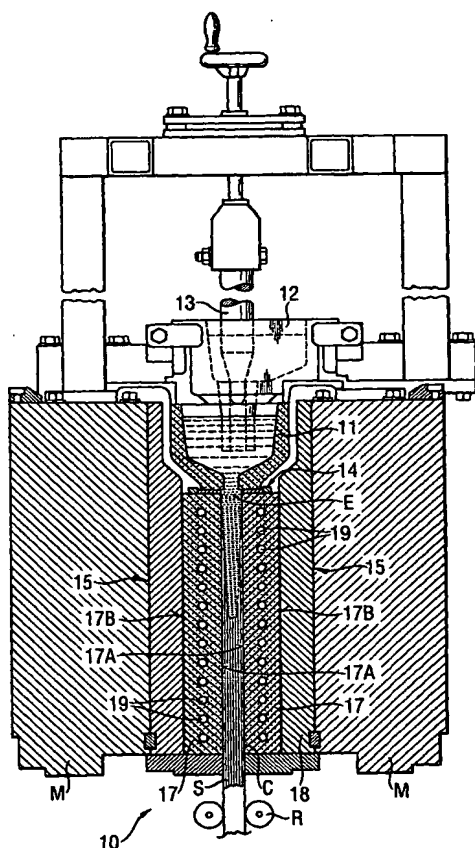
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(54) Title: APPARATUS FOR CONTINUOUS CASTING OF METAL STRIPS



(57) Abstract: Apparatus for continuous vertical casting of metal strips, comprising: a mould (10) having top and bottom ends an open-ended mould cavity (C), a tundish (11) having a discharge opening (11A) in direct communication with the mould cavity (C) to feed molten metal into a mould entrance opening (E) past an interface between the tundish (11) and the mould (10); a sealing device (14) forming a seal at said tundish-mould interface to prevent molten metal from entering said interface, and a device (12) for supplying molten metal to the tundish (11) and maintaining a level of molten metal therein. The sealing device (14) comprises a pair of flat horizontal surfaces (10A, 11B), one on the mould around the entrance opening (E) and one on the tundish (10) around the discharge opening (11A), and a sealing element (14A) formed of a sheet of graphite and being in constant sealing engagement with both said surfaces (10A, 11B).

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- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW, Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR)

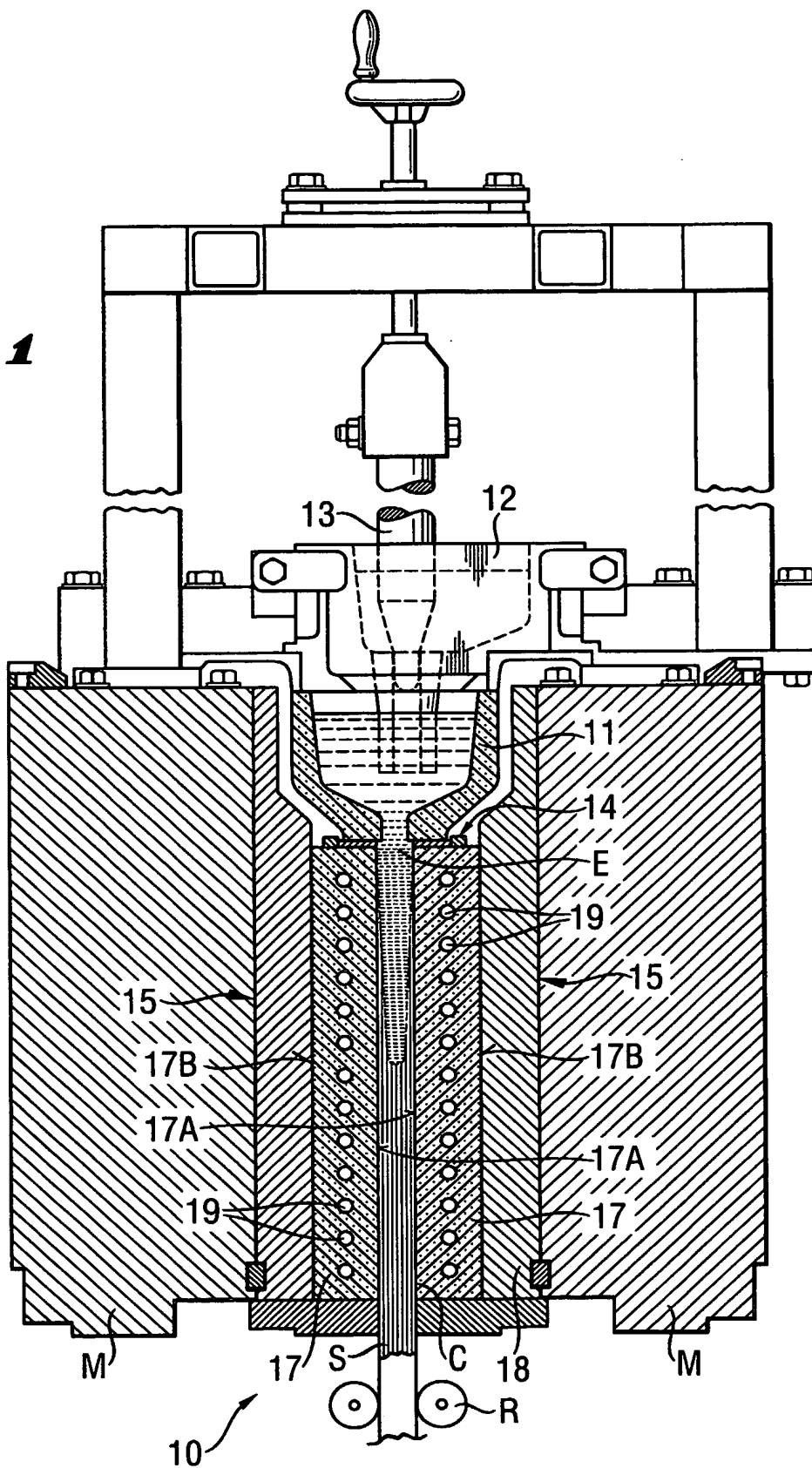
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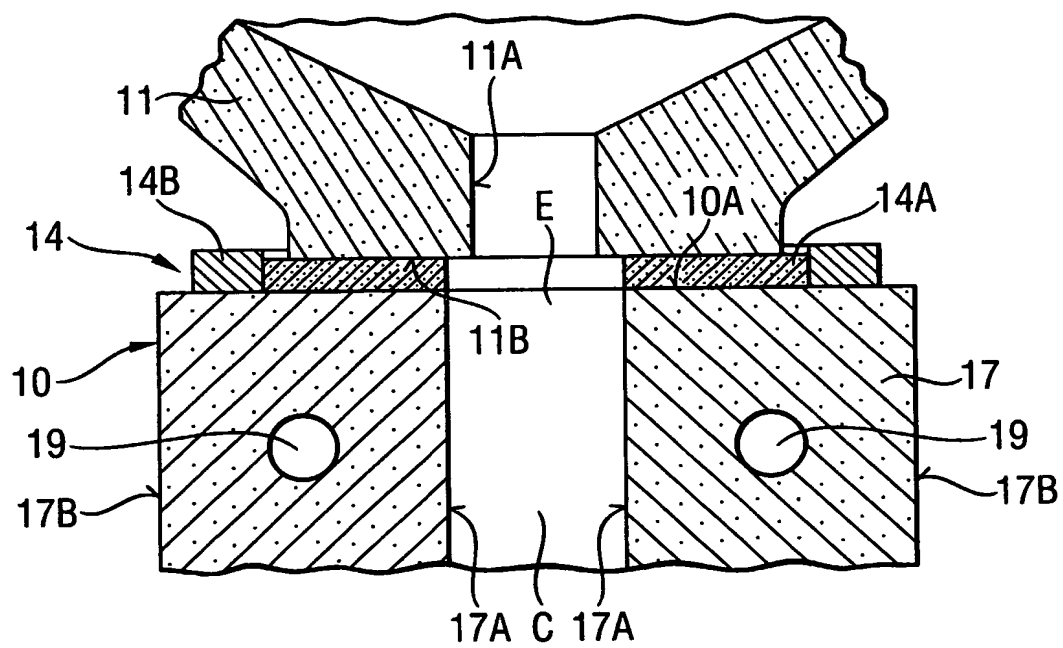
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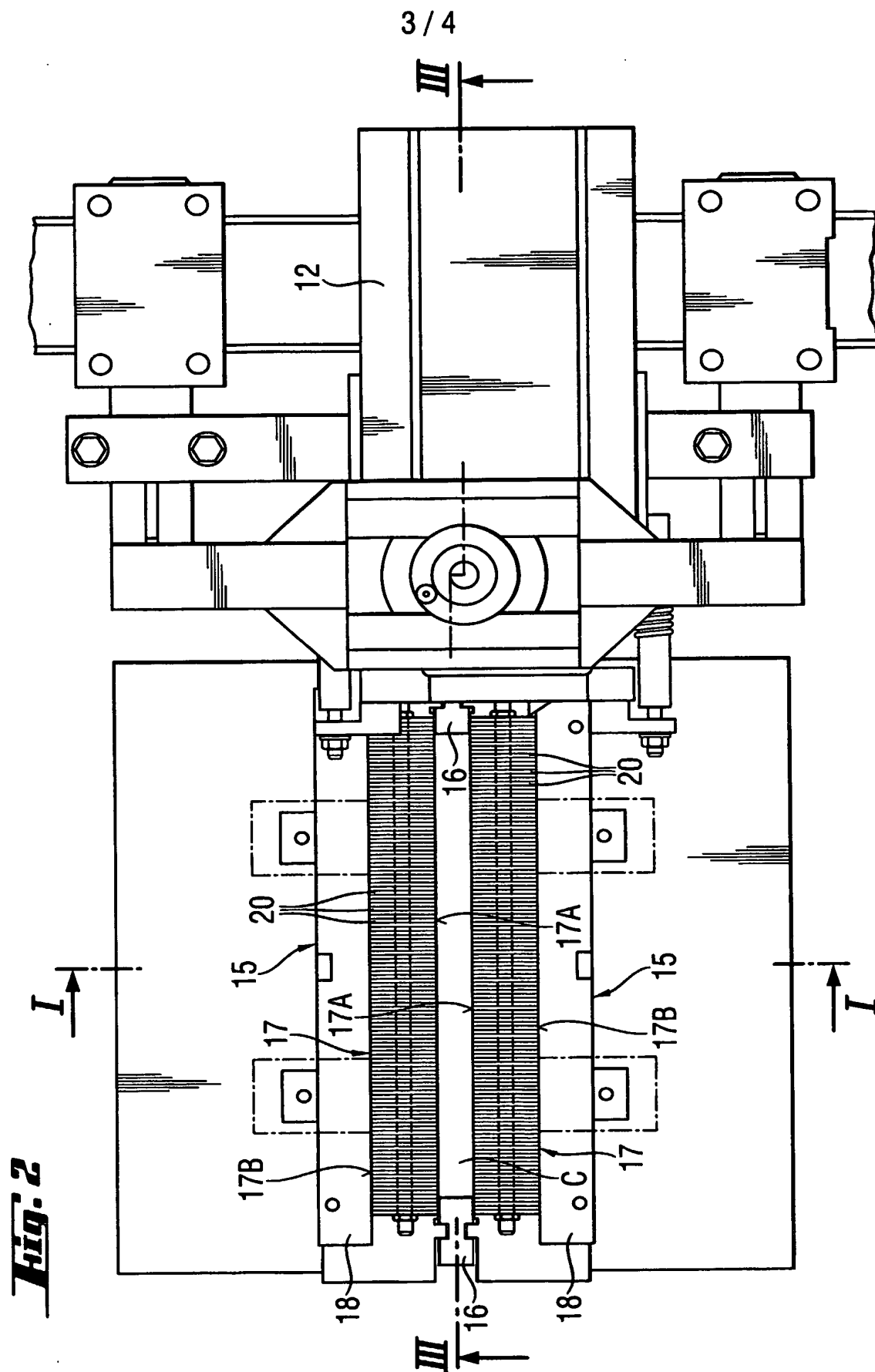
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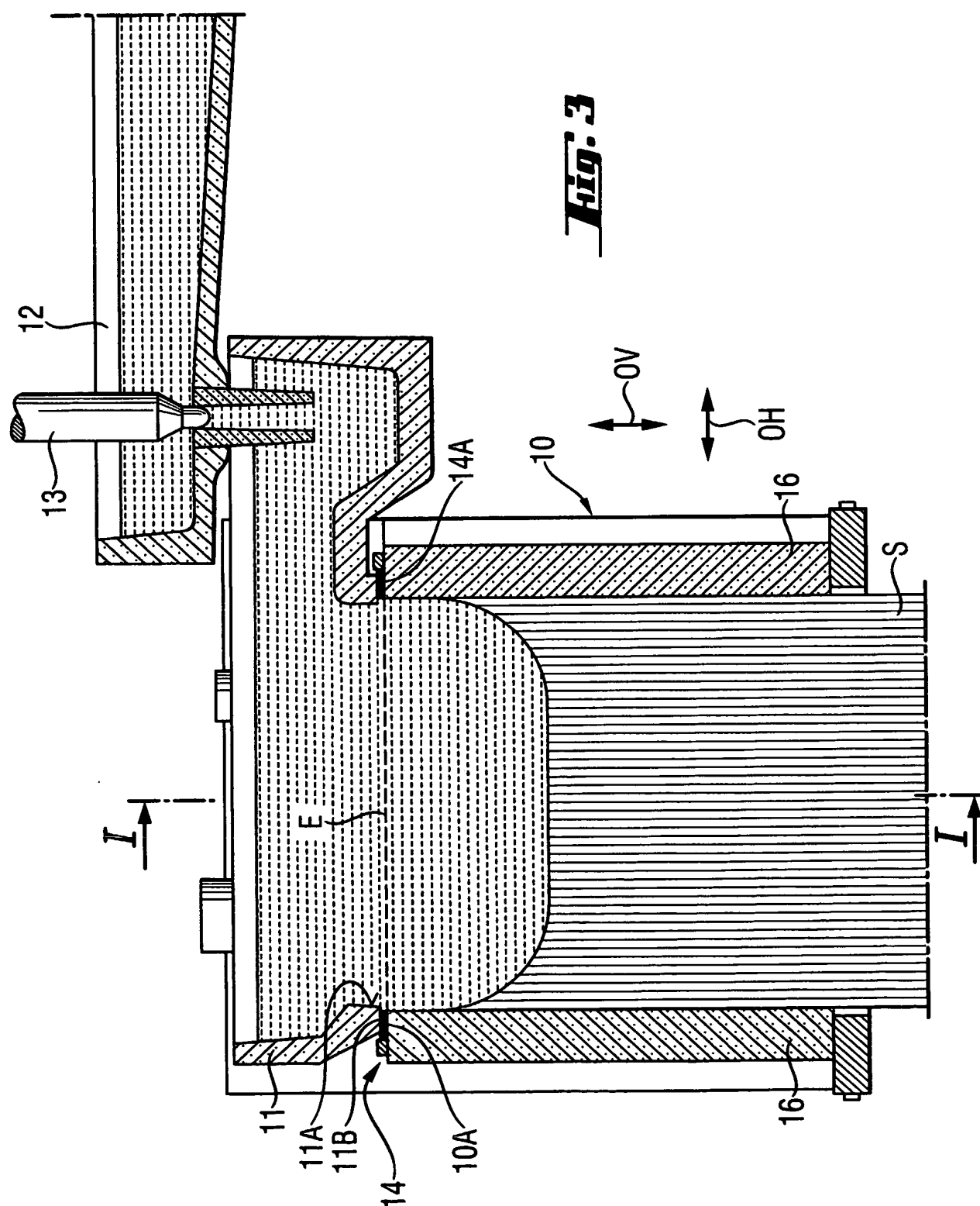
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Fig. 1

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Fig. 1A





INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B22D 11/041

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B. FIELDS SEARCHED

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3381741 A (G.R. GARDNER), 7 May 1968 (07.05.68), column 4, line 19 - column 5, line 33, figures 1-3	1
Y	--	2-3,5
Y	US 3435881 A (W.H. SMITH ET AL), 1 April 1969 (01.04.69)	2-3,5
A	WO 0033991 A1 (CENTRE DE RECHERCHES METALLURGIQUES), 15 June 2000 (15.06.00), abstract	1-6

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3797555 A (CHRISTOPHER JOHN ENGLISH), 19 March 1974 (19.03.74), column 5, line 26 - line 43 --	1-6
A	GB 2034218 A (FRIED. KRUPP GESELLSCHAFT MIT BESCHRÄNKTER HAFTUNG), 4 June 1980 (04.06.80), abstract --	4
A	US 3905418 A (LEONARD WATTS), 16 Sept 1975 (16.09.75), column 2, line 42 - column 4, line 16, figure 2 -- -----	1-6

INTERNATIONAL SEARCH REPORT

Information on patent members

30/12/02

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Patent document cited in search report			Publication date	Patent family member(s)		Publication date
US	3381741	A	07/05/68	NONE		
US	3435881	A	01/04/69	NONE		
WO	0033991	A1	15/06/00	BE	1012325 A	05/09/00
				EP	1051272 A	15/11/00
				JP	2002531273 T	24/09/02
US	3797555	A	19/03/74	BE	787970 A	18/12/72
				BR	7205737 D	00/00/00
				CA	936328 A	06/11/73
				DE	2240795 A,B	19/04/73
				FR	2154440 A,B	11/05/73
				GB	1385985 A	05/03/75
				JP	48041923 A	19/06/73
				SE	397278 B,C	31/10/77
				US	3916985 A	04/11/75
GB	2034218	A	04/06/80	AT	376155 B	25/10/84
				AT	707679 A	15/03/84
				CH	641984 A	30/03/84
				DE	2847581 A,C	14/05/80
US	3905418	A	16/09/75	BE	822576 A	26/05/75
				IT	1026036 B	20/09/78